

What is claimed is:

1. An optical pickup device comprising:
 - a first light source for emitting a first light beam having a first wavelength;
 - a second light source for emitting a second light beam having a second wavelength different from the first wavelength;
 - an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;
 - a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and
 - a diffraction element arranged on the light path from the light sources to the photodetector by way of the two pieces of optical recording medium;
 - at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and

reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

2. An optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element arranged on the light path from the light sources to the photodetector by way of the two pieces of optical recording medium;

each of the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface and the second light beam

adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

3. An optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element arranged on the light path from the optical recording medium to the photodetector and carrying a pair of diffraction gratings arranged on the opposite surface planes of a single plate of a medium;

at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

4. An optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element arranged on the light path from the optical recording medium to the photodetector by way of the two pieces of optical recording medium and carrying a pair of diffraction gratings arranged on the opposite surface planes of a single plate of a medium;

each of the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface and the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

5. An optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element arranged on the light path from the light sources to the optical recording medium and carrying a pair of diffraction gratings arranged on the opposite surface planes of a single plate of a medium;

at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

6. An optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light

beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element having a pair of plates of a medium and arranged on the light path from the signal recording surfaces of the two pieces of optical recording medium to the photodetector, each of said plates carrying a diffraction grating formed on one of the surface planes;

at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

7. An optical pickup device comprising:

a first light source for emitting a first light beam having a first

wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element having a pair of plates of a medium and arranged on the light path from the light sources to the photodetector by way of the two pieces of optical recording medium, each of said plates carrying a diffraction grating formed on one of the surface planes;

each of the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface and the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected

light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

8. An optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element having a pair of plates of a medium and arranged on the light path from the light sources to the signal recording surfaces of the two pieces of optical recording medium, each of said plates carrying a diffraction grating formed on one of the surface planes;

at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording

medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

9. An optical disc device comprising:

a rotary operating mechanism for driving one or more than one optical discs operating so many pieces of optical recording medium as to rotate; and
an optical pickup device arranged opposite to the signal recording surfaces of the one or more than one optical discs driven to rotate by said rotary operating mechanism;

said optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element arranged on the light path from the light sources to the photodetector by way of the two pieces of optical recording medium;

at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

10. An optical disc device comprising:

a rotary operating mechanism for driving one or more than one optical discs operating so many pieces of optical recording medium as to rotate; and

an optical pickup device arranged opposite to the signal recording surfaces of the one or more than one optical discs driven to rotate by said rotary operating mechanism;

said optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element arranged on the light path from the light sources to the photodetector by way of the two pieces of optical recording medium;

each of the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface and the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot

on the light receiving surface of the photodetector.

11. An optical disc device comprising:

a rotary operating mechanism for driving one or more than one optical discs operating so many pieces of optical recording medium as to rotate; and
an optical pickup device arranged opposite to the signal recording surfaces of the one or more than one optical discs driven to rotate by said rotary operating mechanism;

said optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element arranged on the light path from the optical

recording medium to the photodetector and carrying a pair of diffraction gratings arranged on the opposite surface planes of a single plate of a medium;

at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

12. An optical disc device comprising:

a rotary operating mechanism for driving one or more than one optical discs operating so many pieces of optical recording medium as to rotate; and

an optical pickup device arranged opposite to the signal recording surfaces of the one or more than one optical discs driven to rotate by said rotary operating mechanism;

said optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element arranged on the light path from the optical recording medium to the photodetector by way of the two pieces of optical recording medium and carrying a pair of diffraction gratings arranged on the opposite surface planes of a single plate of a medium;

each of the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface and the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

13. An optical disc device comprising:

a rotary operating mechanism for driving one or more than one optical discs operating so many pieces of optical recording medium as to rotate; and

an optical pickup device arranged opposite to the signal recording surfaces of the one or more than one optical discs driven to rotate by said rotary operating mechanism;

said optical pickup device comprising;

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element arranged on the light path from the light sources to the optical recording medium and carrying a pair of diffraction gratings arranged on the opposite surface planes of a single plate of a medium;

at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

14. An optical disc device comprising:

a rotary operating mechanism for driving one or more than one optical discs operating so many pieces of optical recording medium as to rotate; and
an optical pickup device arranged opposite to the signal recording surfaces of the one or more than one optical discs driven to rotate by said rotary operating mechanism;

said optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first

type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element having a pair of plates of a medium and arranged on the light path from the signal recording surfaces of the two pieces of optical recording medium to the photodetector, each of said plates carrying a diffraction grating formed on one of the surface planes;

at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

15. An optical disc device comprising:

a rotary operating mechanism for driving one or more than one optical discs operating as so many pieces of optical recording medium to rotate; and

an optical pickup device arranged opposite to the signal recording surfaces of the one or more than one optical discs driven to rotate by said rotary operating mechanism;

said optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element having a pair of plates of a medium and arranged on the light path from the light sources to the photodetector by way of the two pieces of optical recording medium, each of said plates carrying a diffraction grating formed on one of the surface planes;

each of the first light beam adapted to be used for reading information

signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface and the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.

16. An optical disc device comprising:

a rotary operating mechanism for driving one or more than one optical discs operating so many pieces of optical recording medium as to rotate; and
an optical pickup device arranged opposite to the signal recording surfaces of the one or more than one optical discs driven to rotate by said rotary operating mechanism;

said optical pickup device comprising:

a first light source for emitting a first light beam having a first wavelength;

a second light source for emitting a second light beam having a second wavelength different from the first wavelength;

an objective lens for focussing said first light beam or said second light beam to the signal recording surface of an optical recording medium of a first type matching to the first wavelength or that of an optical recording medium

of a second type matching to the second wavelength, whichever appropriate;

a photodetector for detecting the light beam focussed on the signal recording surface of the optical recording medium of the first type or that of the optical recording medium of the second type, whichever appropriate, by the objective lens and reflected by the signal recording surface; and

a diffraction element having a pair of plates of a medium and arranged on the light path from the light sources to the signal recording surfaces of the two pieces of optical recording medium, each of said plates carrying a diffraction grating formed on one of the surface planes;

at least either the first light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the first type and reflected by the reflecting surface or the second light beam adapted to be used for reading information signals from the signal recording surface of the optical recording medium of the second type and reflected by the reflecting surface being diffracted by the diffraction element, the first reflected light beam and the second reflected light beam being focussed to a same spot on the light receiving surface of the photodetector.